

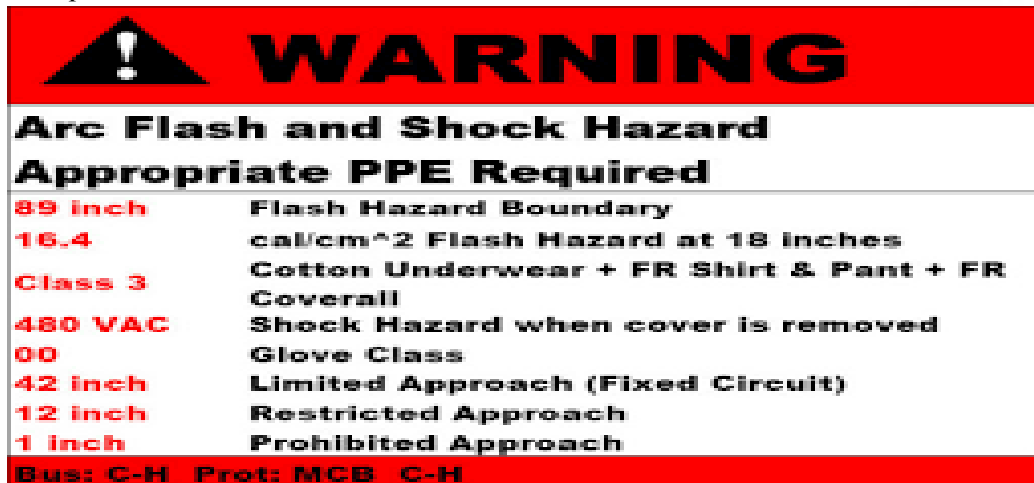
End Semester Examination, December 2017

**Program: M. Tech- HSE and HSE+DM**
**Semester – I**
**Subject (Course): Electrical Safety**
**Max. Marks : 100**
**Course Code : HSFS 7005**
**Duration : 3 Hrs**
**No. of page/s: 2**
**Section-A: Answer the following:**
**20\* 1 = 20 marks**

1. The main cause(s) of arc flash is (are) \_\_\_\_\_ in case of bare conductors. [2]
2. Expand the following: [10]
  - a. AED
  - b. ELCB
  - c. HECP (29 CFR 1910.147)
  - d. DGFASLI
  - e. AFPB
  - f. IER, 1956
  - g. IE of arc flash
  - h. LOTO
  - i. NEC
  - j. RCD
3. Define the following: [8]
  - a. Hazardous Area
  - b. Type-p equipment
  - c. Contact Potential
  - d. CPR

**Section-B: Answer the following:**
**5 \* 8 =40 Marks**

1. Discuss specifications listed in below label:



2. Enumerate various factors that affect impact of shock. [8]
3. Give provisions related to Accident reporting, transformer protection, hazard communication and earthing as per IER 1956. [8]

4. Discuss steps involved for part replacement of coffee maker. [8]
5. "A 45-year-old maintenance employee, with approximately 15 years of electrical experience, was performing a routine adjustment in a 480VAC control panel using an uninsulated screwdriver. While applying additional torque, the screwdriver slipped off the screw head and resulted an arc flash that ignited the employee's shirt and the upper portion of his pants. The employee suffered third-degree burns to his face, neck, chest, arms and groin, and second-degree burns to his legs. Additionally, the employee was wearing a polyester/cotton blend maintenance uniform, which melted and adhered to portions of the employee's torso. The employee was not wearing insulated electrician's gloves with leather protectors, thus the damage to his hands and fingers was significant. The trauma team at the burn clinic stated that this employee will need to undergo skin debridement and grafting for the next 12 weeks, followed by extensive physical therapy and cosmetic surgery. The patient, his wife and his two young children will all require counseling for depression and to learn adequate coping skills."
- a. Point the reasons of accident and those factors worsen the situation. [4]
- b. Brief possible preventive measures that could've avoided the scenario. [4]
- [Or]
6. Define 'Earthing/Grounding' and discuss various kinds of the same. [8]

**Section-C: Answer any two of the following:**

**2 \*20 = 40 Marks**

1. An electrical equipment has the following things on its name plate: "Ex i<sub>b</sub> IIC T1 Z-0". Name and explain the details of terms mentioned above. [4 \*5=20 marks]
2. Explain meaning of the statement "it's the amperes that kill you not the volts", with appropriate examples. Also, discuss the preventive/protective measures to avoid fatalities in electrical accidents. [12+8]
3. Explain various types, construction and working of leakage protection devices used mostly in construction sector, with the help of neat sketches. [20]



Roll No: -----



**UNIVERSITY OF PETROLEUM AND ENERGY STUDIES**

End Semester Examination, December 2017

Program: M. Tech- HSE and HSE+DM

Semester – I

Subject (Course): Electrical Safety

Max. Marks : 100

Course Code : HSFS 7005

Duration : 3 Hrs

No. of page/s: 2

**Section-A: Answer the following:**

20\* 1 = 20 marks

1. The main cause(s) of static deposition is(are) \_\_\_\_\_ in case of non-conductive liquids. [2]
2. Expand the following: [10]
  - a. CPR
  - b. GFCI
  - c. MCCB
  - d. MIE
  - e. AFPB
  - f. IER, 1956
  - g. IE of arc flash
  - h. LOTO
  - i. NESC
  - j. RCCB
3. Define the following: [8]
  - a. Hazardous Area
  - b. Intrinsically Safe
  - c. Touch Potential
  - d. Step potential

**Section-B: Answer the following:**

5 \* 8 =40 Marks

1. Give the classification of hazardous areas as per Indian and International Standards. [4+4]
2. High voltage equipment poses high risk to employees. An EHV equipment is labeled as: Explain specifications listed in the label shown as in the image: [8]

<b>WARNING</b>	
<b>Arc Flash and Shock Hazard</b>	
<b>Appropriate PPE Required</b>	
89 inch	Flash Hazard Boundary
16.4	cal/cm <sup>2</sup> Flash Hazard at 18 inches
Class 3	Cotton Underwear + FR Shirt & Pant + FR Coverall
480 VAC	Shock Hazard when cover is removed
00	Glove Class
42 inch	Limited Approach (Fixed Circuit)
12 inch	Restricted Approach
1 inch	Prohibited Approach
Bus: C-H Prot: MCB C-H	

3. Enumerate various factors that affect impact of shock. [8]
4. Give provisions related to safe clearances of buildings from overhead electrical lines to be maintained as per IER 1956. [8]

5. Discuss steps involved in LOTO. Also, specify the national/international standards in this regard. [8]

[Or]

6. Define 'Earthing/Grounding' and discuss various kinds of the same. [8]

**Section-C: Answer any two of the following:**

**2 \*20 = 40 Marks**

1. A chemical factory. has erected three MS cylindrical storage vessels with a capacity of 24 KI. - 2 nos. and 30 KI. - 1 no. At the time of incident, a tanker lorry with 24 KI. Petroleum product was brought to the premises *for* the purpose of unloading into the installed storage tanks. The workers tried to unload the petroleum product into the left extreme vessel of the 3 vessels (30 KI. capacity) by using the rubber hose, one end of the rubber hose was connected to the out-let valve of the lorry and the other end of the rubber hose was connected to the 30 KI. horizontal tank valve. While transferring the material, there was some leakage at the point of outlet valve connected to the rubber hose. In order to control the leakage, the workers decided to move the lorry to correct position. The driver started the tanker lorry and immediately there was a sudden fire noticed at the out let valve leakage area. The workers tried to put out the fire but they could not do so. Fire spread out to the other area and consequently the storage vessel got suddenly burst out and thrown out from its foundation. Because of this explosion, the petroleum material became a fire ball, causing minor burn injury to about 23 onlookers and nearby factory workers.
  - a. Point the causes of explosion [5]
  - b. Give the sequence of events that lead to devastation. [10]
  - c. How this could've been avoided? [5]
2. Give the function of fuse. Discuss in detail about types of Fuses with their applications and limitations. Also, give its comparison with MCB & ELCB. [4+10+6]
3. Enlist & discuss various protection schemes to be employed for electrical equipment in hazardous areas. Give their applicable areas of usage. [3+12+5]